

Kinetic Inductance Parametric Up-converter

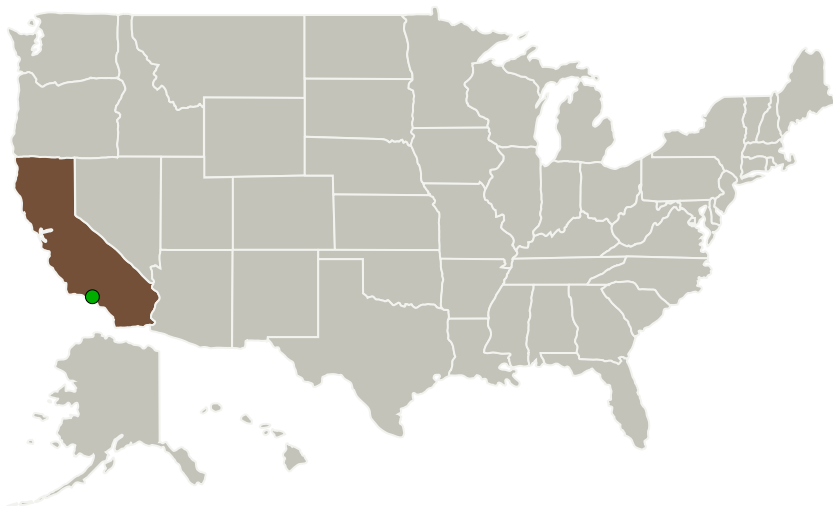
Completed Technology Project (2014 - 2019)



Project Introduction

We propose to develop a new sensitive current amplifier that can be used to monitor the signals from large arrays of cryogenic detectors such as Transition Edge Sensors and Magnetic Microcalorimeters. This new device, which we refer to as the Kinetic Inductance Parametric Up-converter (KPUP), makes use of the nonlinear kinetic inductance of a superconducting wire. The nonlinear inductor is part of a microwave frequency resonant circuit that includes a DC connection for the input current signal. The KPUP up-converts that low frequency signal to the microwave band, allowing many signals to be encoded into a single microwave output channel. The devices do not require Josephon junctions and are much simpler to manufacture than microwave-coupled SQUIDs. Our measurements have already shown that the noise added by the upconversion and demodulation process is comfortably below the level of phonon noise from a typical TES bolometer. This project will focus on demonstrating phonon noise limited readout of arrays of TES bolometers using the KPUP. For large arrays, we will implement a two-stage multiplexing strategy where the signals from several bolometers are combined and read out using a single KPUP, then several KPUPs share a single microwave readout channel.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Astrophysics Research and Analysis

Project Management

Program Director:

Michael A Garcia

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Primary U.S. Work Locations

California

Project Management (cont.)

Program Manager:

Dominic J Benford

Principal Investigator:

Henry G Leduc

Co-Investigator:

Peter K Day

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destination

Outside the Solar System